SOLVING DISCRETE MODELS OF INTERFACIAL DISSIPATION: COMPLEMENTARITY VS. REGULARIZATION

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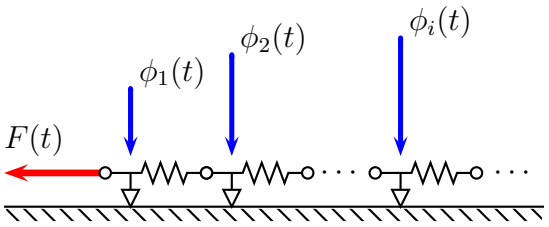
This work considers the dissipation arising from a series-series Iwan model with time-varying normal and tangential forcing. This analysis is motivated by a desire to approximate the time-varying normal and shear loads that are seen in real joints.



The model can be described as a collection of n series Iwan (or Jenkins) elements with Coulomb friction connected in a series configuration. The solution to this problem is developed using two competing techniques. In the first the system is re-cast as a complementarity problem while in the latter the problem is regularized by addition of inertia terms. With each solution technique the predicted dissipation per unit forcing cycle is approximately identical. Each method, however, has its shortcomings. The computational requirements necessary to solve the regularized problem are significantly larger than those necessary to solve the complementarity problem, although the latter fails to converge on occasion. If the frictional intensity (normal load times friction coefficient) varies in time, the dissipation per forcing cycle scales with the forcing amplitude to a fractional power between two and three, which is in agreement with experimental findings.